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**AQUATIC INVERTEBRATES AND HABITAT AT A FIXED
STATION ON THE CLARK FORK OF THE FLATHEAD RIVER,
MISSOULA COUNTY, MONTANA**

August 22, 2001

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**A report to
the Montana Department of Environmental Quality
Helena, Montana**

**by
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INTRODUCTION

This report is one of 38 brief interpretive summaries of data assembled as part of a statewide, multi-year study conducted by the Montana Department of Environmental Quality (MT DEQ). Each report discusses information generated from a single benthic invertebrate sample collection and habitat evaluation at a fixed station established on a gauged river or high-order tributary. The present treatise focuses on the aquatic community sampled on the Clark Fork of the Flathead River near Turah, Montana on August 22, 2001. The sample site was located by GPS reading at 46° 49' 18" N, 113° 48' 29" W, lying within the Montana Valley and Foothill Prairie Ecoregion (Woods et al. 1998). The sample was collected by personnel of MT DEQ. Sampling effort consisted of either a composite of four Hess samples, or a one-minute kicknet collection (Bukantis 1998). Habitat parameters were evaluated using the MT DEQ Macroinvertebrate Habitat Assessment Field Form for streams with riffle/run prevalence. Invertebrate samples were processed and animals identified by Rhithron Associates, Inc. Analysis of invertebrate assemblages was accomplished by applying the revised method (Bollman 1998) for streams of Western Montana's ecoregions. The method uses a multimetric battery to evaluate disturbance to biotic integrity.

The revised bioassessment metric battery and its scoring criteria have not been evaluated for application to higher-order streams and rivers; to date, no bioassessment method has been contrived for these waterways in Montana. Thus, the method used here is likely to have limitations in its applicability to the sites in this study. For example, 24 of the riverine or high-order waterways sampled for the fixed station study were located within Western Montana ecoregions and were sampled between July 23 and August 25, 2001. Mean water temperature for these sites at the time of sampling was 19.8°C (median = 19.4°). Temperatures ranged from 15.5°C (Kootenai River near Libby) to 25.3°C (Jefferson River near Three Forks). Ninety-eight sites from Western Montana were used to assemble the revised metric battery and to test it for sensitivity in detecting impairment, to establish scoring criteria, and to improve robustness of bioassessment. These 98 sites were mainly second and third order streams; the sampling season roughly corresponded to that of the fixed-station study. Mean water temperature for these sites at the time of sampling was 15°C (median = 14°C). Natural variations in benthic community composition and structure along longitudinal and thermal gradients are well known phenomena. Thus, scores and classifications were established for much smaller systems with significantly lower water temperatures; impairment classifications and use support designations in this study must be interpreted with care. Results from the application of other metric batteries may be found in the Appendix.

RESULTS AND DISCUSSION

Table 1 itemizes the nine evaluated habitat parameters and shows the assigned scores for each, as well as the integrated score and condition category.

Overall habitat conditions scored sub-optimally. Instream habitats were perceived to be compromised by some degree of embeddedness of substrate particles. Channelization appeared to alter the natural morphology of the river. Flow conditions were judged sub-optimal at this site. Moderate instability of the left streambank was reported; the right bank was judged to be in better condition, but some instability was perceived on that side as well. Some disruption of bank vegetation was observed on the

left side of the channel. The riparian zone width was abbreviated on both sides of the river.

Table 1. Stream and riparian habitat assessment for a fixed station on the Clark Fork of the Flathead River. August 2001.

Max. possible score	Parameter	Clark Fork River near Turah
10	Riffle development	10
10	Benthic substrate	9
20	Embeddedness	13
20	Channel alteration	13
20	Sediment deposition	16
20	Channel flow status	13
20	Bank stability: left / right	5 / 8
20	Bank vegetation: left / right	8 / 9
20	Vegetated zone: left / right	8 / 7
160	Total	119
	Percent of maximum CONDITION*	74 SUB-OPTIMAL

*Condition categories: Optimal > 80% of maximum score; Sub-optimal 75 - 56%; Marginal 49 - 29%; Poor <23%
Adapted from Plafkin et al. 1998.

Table 2. Metric values, scores, and bioassessment for a fixed station on the Clark Fork of the Flathead. The revised bioassessment metric battery (Bollman 1998) was used for the evaluation. August 2001.

	Clark Fork River near Turah	
METRICS	METRIC VALUES	METRIC SCORES
Ephemeroptera richness	8	3
Plecoptera richness	2	2
Trichoptera richness	7	3
Number of sensitive taxa	2	2
Percent filterers	51.8	0
Percent tolerant taxa	23.9	1
	TOTAL SCORE (max.=18)	11
	PERCENT OF MAX.	61
	Impairment classification	SLIGHT
	USE SUPPORT	PARTIAL

Bioassessment results are given in Table 2. When this bioassessment method is applied to these data, scores indicate that this site on the Clark Fork of the Flathead River is slightly impaired and only partially supports designated uses.

Despite the rich mayfly fauna (8 taxa) represented in the sample, no taxon was particularly abundant, except for the ubiquitous *Baetis tricaudatus*. This low abundance,

along with the slightly elevated biotic index value (4.49) suggests a very mild impairment of water quality by nutrient enrichment. While the metals tolerance index calculated for this assemblage (4.24) was slightly elevated, it seems unlikely that metals pollution affected the benthic community, since no other shifts in abundance or composition associated with this type of impact were present in the assemblage structure.

Seven caddisfly taxa and 20 “clinger” taxa were collected in the sample, implying that hard substrate surfaces were available for colonization without much impairment by fine sediment deposition. The high number of taxa collected at the site suggests that instream habitats were diverse and abundant. Stonefly taxa richness and abundance was lower than expected, suggesting that some reach-scale habitat features such as channel alteration, streambank stability, or riparian function may have been limited. Functionally, the assemblage appeared to include all of the expected components. Filter-feeders were the dominant contributors, and scrapers were somewhat less abundant than expected.

CONCLUSIONS

- The taxonomic composition of the benthic assemblage may reflect some very mild impairment of water quality due to nutrient enrichment.
- Diverse instream habitats seemed to be abundant, supporting a rich benthic fauna.
- The bioassessment method employed appears to have assigned an appropriate impairment category to this site, considering the taxonomic composition and tolerance characteristics of the benthic assemblage. The bioassessment score may under-estimate the quality of the fauna; in particular, the abundance of filter-feeders and the contribution of tolerant taxa seem to be appropriate for a riverine environment.

LITERATURE CITED

Bollman, W. 1998. Improving Stream Bioassessment Methods for the Montana Valleys and Foothill Prairies Ecoregion. Master's (M.S.) Thesis. University of Montana. Missoula, Montana.

Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP's. Working draft, April 22, 1997. Montana Department of Environmental Quality. Planning Prevention and Assistance Division. Helena, Montana.

Woods, A.J., Omernik, J. M. Nesser, J.A., Sheldon, J., and Azevedo, S. H. 1999. Ecoregions of Montana. (Color poster with map, descriptive text, summary tables, and photographs). Reston, Virginia. US Geological Survey.

APPENDIX

Taxonomic data and summaries

Clark Fork of the Flathead River

August 2001

Aquatic Invertebrate Taxonomic Data

Site Name: Clark Fork of the Flathead River near Turah

Date: 8/22/01

Site ID: C02CKFKR02

Approx. percent of sample used: 10

Taxon	Quantity	Percent	HBI	FFG
<i>Acentrella turbida</i>	3	0.92	4	CG
<i>Baetis tricaudatus</i>	12	3.68	4	CG
<i>Dipheter hageni</i>	1	0.31	5	CG
<i>Attenella margarita</i>	1	0.31	2	CG
<i>Drunella spinifera</i>	2	0.61	0	PR
<i>Serratella tibialis</i>	5	1.53	2	CG
<i>Epeorus albertae</i>	1	0.31	2	CG
<i>Rhithrogena</i> sp.	3	0.92	0	CG
Total Ephemeroptera	28	8.59		
<i>Hesperoperla pacifica</i>	2	0.61	2	PR
<i>Isogenoides</i> sp.	5	1.53	3	PR
Total Plecoptera	7	2.15		
<i>Arctopsyche grandis</i>	3	0.92	2	PR
<i>Brachycentrus occidentalis</i>	26	7.98	2	CF
<i>Glossosoma</i> sp.	1	0.31	0	SC
<i>Cheumatopsyche</i> sp.	28	8.59	5	CF
<i>Hydropsyche</i> sp.	88	26.99	5	CF
<i>Lepidostoma</i> sp.-sand case larvae	3	0.92	1	SH
<i>Rhyacophila</i> -early instar	1	0.31	0	PR
Total Trichoptera	150	46.01		
<i>Petrophila</i> sp.	13	3.99	5	SC
Total Lepidoptera	13	3.99		
<i>Heterlimnius</i> sp.	5	1.53	3	CG
<i>Optioservus</i> sp.	15	4.60	5	SC
<i>Zaitzevia</i> sp.	22	6.75	5	CG
Total Coleoptera	42	12.88		
<i>Simulium</i> sp.	27	8.28	5	CF
<i>Antocha</i> sp.	3	0.92	3	CG
Total Diptera	30	9.20		
<i>Cricotopus Brevipalpis</i> Gr.	10	3.07	7	SH
<i>Cricotopus (Isocladius)</i> Gr.	1	0.31	7	CG
<i>Cricotopus nostococladus</i>	4	1.23	6	PH
<i>Cricotopus Trifascia</i> Gr.	1	0.31	7	CG
<i>Eukiefferiella Devonica</i> Gr.	7	2.15	8	CG
<i>Eukiefferiella Gracei</i> Gr.	4	1.23	8	CG
<i>Eukiefferiella Pseudomontana</i> Gr.	1	0.31	8	CG
<i>Micropsectra</i> sp.	11	3.37	4	CG
<i>Pagastia</i> sp.	4	1.23	1	CG
<i>Polypedium</i> sp.	1	0.31	6	SH
<i>Rheocricotopus</i> sp.	2	0.61	4	CG
<i>Tvetenia</i> sp.	10	3.07	5	CG
Total Chironomidae	56	17.18		
Grand Total	326	100.00		

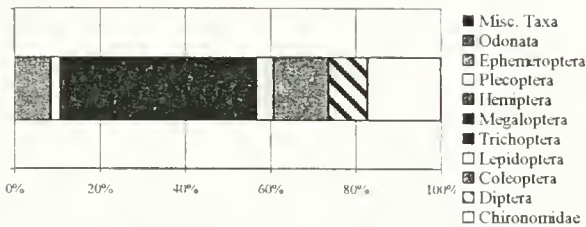
Aquatic Invertebrate Summary

Site Name: Clark Fork of the Flathead River near Tui Date: 8/22/01

SAMPLE TOTAL	326
EPT abundance	185
TAXA RICHNESS	35
Number EPT taxa	17
Percent EPT	56.75

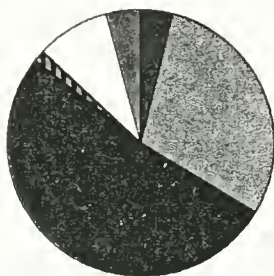
TAXONOMIC COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Misc. Taxa	0.00	0	0
Odonata	0.00	0	0
Ephemeroptera	8.59	8	28
Plecoptera	2.15	2	7
Hemiptera	0.00	0	0
Megaloptera	0.00	0	0
Trichoptera	46.01	7	150
Lepidoptera	3.99	1	13
Coleoptera	12.88	3	42
Diptera	9.20	2	30
Chironomidae	17.18	12	56



FUNCTIONAL COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Predator	3.99	5	13
Parasite	0.00	0	0
Gatherer	29.75	19	97
Filterer	51.84	4	169
Herbivore	0.00	0	0
Piercer	1.23	1	4
Scraper	8.90	3	29
Shredder	4.29	3	14
Xylophage	0.00	0	0
Omnivore	0.00	0	0
Unknown	0.00	0	0



- Predator
- Parasite
- Gatherer
- Filterer
- Herbivore
- Piercer
- Scraper
- Shredder
- Xylophage
- Omnivore
- Unknown

COMMUNITY TOLERANCES

Sediment tolerant taxa	1
Percent sediment tolerant	0.92
Sediment sensitive taxa	3
Percent sediment sensitive	2.45
Metals tolerance index (McGuire)	4.24
Cold stenotherm taxa	2
Percent cold stenotherms	1.84

Site ID: C02CKFKR02

DOMINANCE

TAXON	ABUNDANCE	PERCENT
<i>Hydropsyche</i> sp	88	26.99
<i>Cheumatopsyche</i> sp	28	8.59
<i>Simulium</i> sp	27	8.28
<i>Brachycentrus occidentalis</i>	26	7.98
<i>Zaitzevia</i> sp	22	6.75
SUBTOTAL 5 DOMINANTS	191	58.59
<i>Ophioservus</i> sp	15	4.60
<i>Petrophila</i> sp	13	3.99
<i>Baetis tricaudatus</i>	12	3.68
<i>Micropectra</i> sp	11	3.37
<i>Cnecotopus Brevipalpis</i> Gr	10	3.07
TOTAL DOMINANTS	252	77.30

SAPROBITY

Hilsenhoff Biotic Index	4.49
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DIVERSITY

Shannon H (log _e)	2.42
Shannon H (log ₂)	3.49
Simpson D	0.10

VOLITINISM

TYPE	ABUNDANCE	PERCENT
Multivoltine	83	25.46
Univoltine	170	51.99
Semivoltine	74	22.55

TAXA CHARACTERS

	#TAXA	ABUNDANCE	PERCENT
Tolerant	5	78	23.93
Intolerant	2	6	1.84
Clinger	20	244	74.85

BIOASSESSMENT INDICES

B-IBI (Karr et al.)

METRIC	VALUE	SCORE
Taxa richness	35	3
E richness	8	3
P richness	2	1
T richness	7	3
Long-lived	4	3
Sensitive richness	2	1
%tolerant	23.93	3
%predators	3.99	1
Clinger richness	20	3
%dominance (3)	43.87	5
TOTAL SCORE	26	52 %

MONTANA DEQ METRICS (Bukantus 1998)

METRIC	VALUE	Plains Ecoregions	Valleys and Foothills	Mountain Ecoregions
Taxa richness	35	3	3	3
EPT richness	17	3	3	2
Biotic Index	4.49	3	2	1
%Dominant taxon	26.99	3	3	2
%Collectors	81.60	1	1	0
%EPT	56.75	3	2	2
Shannon Diversity	3.49	3		
%Scrapers + Shredd	13.19	1	1	0
Predator taxa	5	2		
%Multivoltine	25.46	3		
%H of T	77		2	
TOTAL SCORES		25	17	10
PERCENT OF MAXIMUM		83.33	70.83	47.62
IMPAIRMENT CLASS		NON	SLIGHT	MODERATE

Montana DEQ metric batteries

